

THREE NEW AUSTRALIAN CHIGGER NYMPHS (ACARINA, TROMBICULIDAE).

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(Forty-four Text-figures.)

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Synopsis.

The nymphs of *Euschöngastia cairnsensis*, *Trombicula antechinus* and *Acomatacarus australiensis* are described.

Since the publication of my first two descriptions of Australian nymphal *Euschöngastia* (These PROCEEDINGS, 80, 1955, pp. 57 and 130), material of a third species reared many years ago has come to hand, and nymphs of two species of other genera have been reared. These three nymphs, *Euschöngastia cairnsensis*, *Trombicula antechinus* and *Acomatacarus australiensis*, are described below, and a note on the larval tracheal system of the last named is added.

EUSCHÖNGASTIA CAIRNSENSIS (Womersley & Heaslip, 1943).

Types: Three morphotype nymphs in Queensland Institute of Medical Research, Brisbane, reared from engorged larvae from *Isoodon obesulus* Shaw and Nodder, Cowan Cowan, Moreton Is., Q., April-May, 1941, by D. J. W. Smith. Associated larval pelts accompany the specimens.

Description of Nymph.

Body: Mean idiosomal length 575μ (544μ to 590μ), breadth across propodosoma 342μ , across hysterosoma 303μ . Fairly well marked constriction at level of posterior pair of coxae; colour in life unknown, although mounted specimens are quite yellow. Genital area oval (Text-fig. 5), 74μ long; anterior sucker 17.5μ to 19.3μ , posterior sucker 15.7μ to 17.5μ long. Genital plates with about five or six ciliated setae each; inner genital setae 3.3 and simple. Anal plates (Text-fig. 9) stout, 48μ long, well sclerotized anteriorly, with three or four pairs of ciliated setae. Genitalia just behind level of coxae IV, and anal plates separated by about half their own length from genitalia.

Palpi (Text-figs. 7 and 8) five-segmented; femur with three or four and genu with six or seven dorso-lateral ciliated setae. Tibia with simple claw 28μ long, two inner spathulate accessory combs, and an external forwardly directed nude seta set near base of claw, in addition to about four dorso-external and a single internal ciliated setae near insertion of tarsus. Tarsus with about eight ciliated setae, three apical nude setae, and a single external sub-basal sensory rod.

Gnathosoma: Hypostome (Text-fig. 2) similar to other described species, with fourteen to sixteen nude apical setae and about twenty-two ciliated setae on ventral surface. Chelicerae (Text-fig. 3) normal, with finely serrated concave dorsal edge, blade 48μ long.

Legs: Leg I largest, leg IV longer than legs II and III, which are sub-equal; all seven-segmented. Coxae in two groups, with numerous ciliated setae; only coxae I fused medially. All tarsi with two distinct claws. Precoxal plates (Text-fig. 6) with three to five ciliated setae each. Tarsus I (Text-fig. 4) without preapical dorsal process, stout, 199μ long, 62μ high, tibia I 83μ long, tarsus II 64μ long, tibia II 41μ long.

Scutum (Text-fig. 1): Sensillary area almost triangular, constricting rapidly in front of sensillary bases. Anterior margin of tectum invisible. Single ciliated tectal seta present. Sensillary area without median carina, but with saddle bridging sensillary bases. Posterior apodeme with irregular sides, with two diverging lines at apex. Sensillae filiform, of normal type, with apical ciliations to 26μ long. Eyes absent,

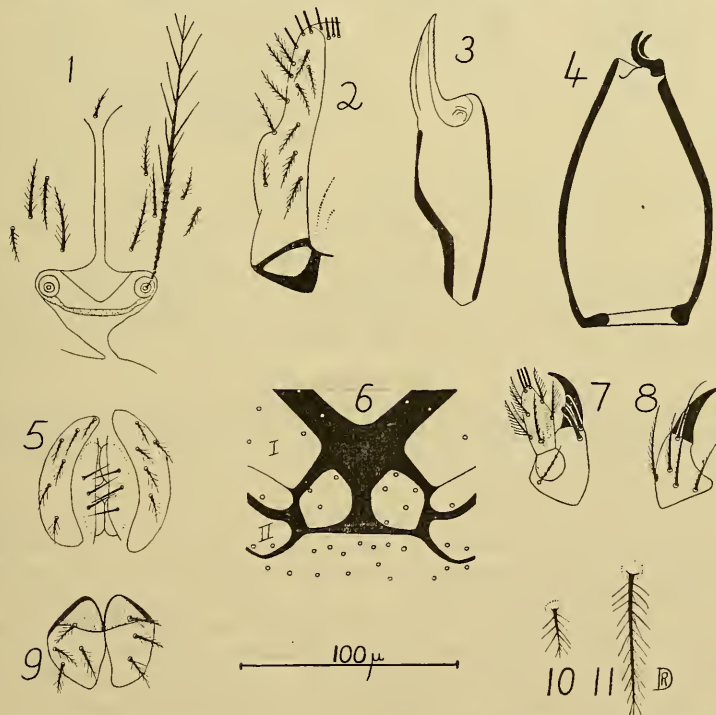
parascutal setae one on each side, with variable number of ciliated setae near by. The scutal standard data are given in Table 1.

Setation: Body setation very similar to that of *E. smithi*. Length of setae behind scutum (Text-fig. 10) to 24.6μ , length of terminal setae (Text-fig. 11) to 63μ . The types

TABLE 1.
Standard Data (in Micra) of Scutum of E. cairnsensis.

CTL.	ASL.	SB.	$\frac{ASL.}{SB}$	PSL.	PAD.	TS.	SS.	SENS.
67	81	49	1.65	17.6	28.1	—	28.0	130
60	74	44	1.68	14.0	31.6	19.3	26.3	123
67	77	44	1.75	14.0	24.6	19.3	28.0	118
Means :								
64.7	77.3	45.7	1.69	15.2	28.1	19.3	27.4	124

of leg setae are as in *E. perameles*, but the sensory setae on tarsus I are not quite as numerous. Blunt finger-like setae to 21.1μ long, ciliated setae to 24.6μ long. Fine tapering setae shorter and more numerous ventrally, as in other two species below.



Text-figs. 1-11.—*Euschöngastia cairnsensis*. Nymph. 1, scutum; 2, hypostome in ventral view; 3, chelicera; 4, tarsus I in lateral view; 5, genitalia; 6, precoxal area; 7 and 8, palpal tibia and tarsus in internal and external view; 9, anal plates; 10 and 11, body setae from near scutum and from end of hysterosoma.

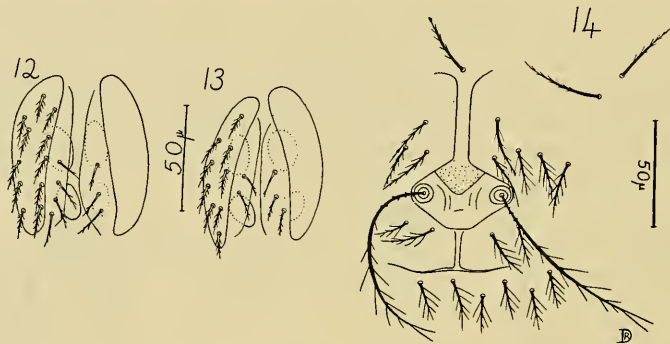
EUSCHÖNGASTIA PERAMELES (Womersley, 1939).

A larger series of new nymphal material has been reared, and shows that the genitalia illustrated previously (These PROCEEDINGS, 80, 1955, p. 59) are an extreme form. No distinction was then made between the inner genital setae and the setae on the

genital plates, as all were ciliated. Nearly all the new specimens show 3.3 inner genital setae, with several ciliations, but the range is from 2.2 and 2.3 through to 4.5. Two rather more typical specimens are illustrated below (Text-figs. 12 and 13). The number of ciliated setae on the genital plates is very variable, ranging from about eight to fifteen.

The data given for the palpal tibia and tarsus are correct in essentials, and may now be said to conform completely to the pattern given below.

The new material is as follows: Five nymphs from *Isoodon obesulus*, Rockhampton, May, 1955; eight nymphs from same host, Paddington, Brisbane, August to September, 1955; four nymphs from *Perameles nasuta* Geoffroy, Mt. Glorious, September, 1955. The latter is the first record of *E. perameles* on this genus. Another series of larvae was taken on this host, same locality, 22.xi.55, but no nymphs were obtained. *P. nasuta* is not nearly as common as the other local bandicoot, *I. obesulus*; only six of more than two hundred bandicoots examined have been this species.



Text-figs. 12-13.—*Euschöngastia perameles*. Nymph. Genitalia, amended.
Text-fig. 14.—*Trombicula antechinus*. Nymph. Scutum.

EUSCHÖNGASTIA SMITHI (Womersley, 1939).

There is nothing to add to the description of the nymph of this species (These PROCEEDINGS, 80, 1955, p. 130), except to note that the illustration of the inner surface of the palpal tibia and tarsus does not show the position of the external setae.

DISCUSSION.

Three Australian species of *Euschöngastia* Ewing are now known to me as nymphs, and all are of remarkably similar facies. The majority of morphological characters are almost identical, including the hypostome, the sensory setae of the legs, the precoxal area, the genital and anal areas, and the setation of the palpi.

Since Womersley's figures (1952) indicate that the setation of the palpal tibia and tarsus is possibly not constant for all trombiculine genera or subgenera, e.g. *globularis* group and *Leptotrombidium*, a detailed account of the constant pattern of the three *Euschöngastia* species is given.

Tibia: 1. A single terminal claw. 2. Two dorso-internal accessory combs set in tandem at base of claw. 3. A single nude external seta set near base of claw, and running forward parallel to claw. 4. A single (very occasionally two) internal ciliated seta set near insertion of tarsus. 5. Several dorso-external ciliated setae.

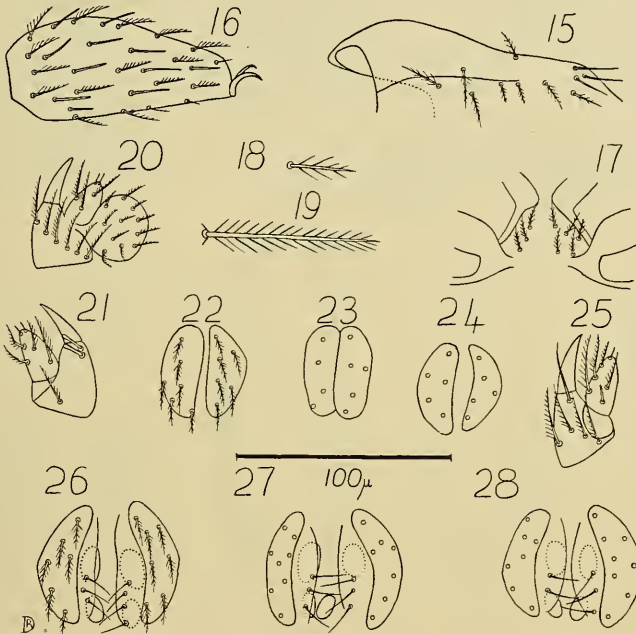
Tarsus: 6. A single external sub-basal sensory rod. 7. About three or four apical nude setae rather similar to those at tip of hypostome. 8. Eight or nine ciliated setae.

E. cairnsensis, like *E. smithi* and *E. perameles*, runs to couplet 10 of Womersley's key (1952, p. 376), but none of the three is related to the two species included in this couplet. *E. perameles* is readily separated by its relatively uniform body setation, and consistently more setae on the precoxal, genital and anal plates. The larva of *E. perameles* is also a distinct form. However, *E. cairnsensis* and *E. smithi* are almost identical, and can only be separated by the nature of the inner genital setae, and

possibly by the sensillae. The inner genital setae are ciliated in *E. perameles*, simple or bifurcate in *E. smithi*, and simple in *E. cairnsensis*. The larvae of *E. smithi* and *E. cairnsensis* are readily separated.

TROMBICULA ANTECHINUS Womersley, 1954.

Types: Three morphotype nymphs in Queensland Institute of Medical Research, Brisbane, and one each at Institute for Medical Research, Kuala Lumpur, and South Australian Museum, Adelaide. All specimens are accompanied by correlated larval pelts, and were reared from engorged larvae from inside the ears of *Rattus assimilis* Gould, Mt. Glorious, Q., September, 1955.



Text-figs. 15-28.—*Trombicula antechinus*. Nymph. 15, hypostome in ventral view; 16, tarsus I in lateral view; 17, sternum; 18 and 19, body setae from near scutum and from end of hysterosoma; 20, palp with abnormal growth; 21, internal view of palpal tibia and tarsus; 22, 23 and 24, anal plates; 25, external view of palpal tibia and tarsus; 26, 27 and 28, genitalia.

Description of Nymph.

Body: Mean idiosomal length 638μ (620μ to 652μ); breadth across propodosoma 264μ , across hysterosoma 310μ ; well marked constriction at level of posterior pair of coxae; pale straw colour in life. Genital area oval (Text-figs. 26 to 28), 60μ long, with two pairs of genital suckers; anterior sucker 14.6μ to 16.7μ , posterior sucker 10.5μ to 13.9μ long. Genital plates with about seven or eight ciliated setae each; inner genitalia generally with 3.3 simple setae, but ranging from 2.3 to 3.4. Anal plates (Text-figs. 22 to 24) 48μ long, slightly sclerotized, with four to six ciliated setae each. Genitalia placed just behind coxae IV, and anal plates separated by about their own length from genitalia.

Gnathosoma: Chelicerae typical, with concave dorsal edge of blade slightly serrate; blade 58μ long. Hypostome (Text-fig. 15) of typical shape, but with only seven or eight rather long simple setae apically. About sixteen ciliated setae on base of gnathosoma.

Palpi (Text-figs. 21 and 25) five-segmented, of typical structure. Femur with two or three and genu with six to eight (ten on one side of one specimen) ciliated dorso-lateral setae. Tibia with simple claw 30μ long, two internal accessory spatulate combs,

and an external forwardly directed nude seta set near base of claw, in addition to about four dorso-external and a single (two on one side of one specimen) internal ciliated seta near insertion of tarsus. Tarsus with nine ciliated setae, about three or four nude apical setae, and a single external sub-basal sensory rod. Near the insertion of the tarsus of one specimen there is attached by a short stem a spherical growth which has several ciliated setae (see Text-fig. 20).

Legs: Leg I largest, leg IV longer than legs II and III, which are sub-equal; all seven-segmented; with distinct sternum present between coxae I and II (Text-fig. 17) with about six to eight ciliated setae. All tarsi with two strong claws (Text-fig. 16). Coxae I and II and III and IV in two distinct groups, with numerous ciliated setae. Tarsus I 109μ long, 37μ high, tibia I 81μ long, tarsus II 63μ long, tibia II 37μ long. Tarsus I without preapical dorsal process (Text-fig. 16).

Scutum (Text-fig. 14). Sensillary area clearly diamond-shaped, with anterior corner punctate. Tectum with anterior margin indistinct, and with single ciliated tectal seta. Saddle poorly defined, but posterior apodeme distinct. Sensillae filiform, of fairly uniform thickness, with basal barbules merging into ciliations to 28μ long apically. Eyes absent. Parascutal setae one on each side with varying number of setae near by. The scutal standard data are given in Table 2.

TABLE 2.
Standard Data (in Micra) of Scutum of T. antechinus.

CTL.	ASL.	SB.	$\frac{ASL}{SB}$	PSL.	PAD.	TS.	SS.	SENS.
46	58	36	1.61	17.6	39	35	32	—
49	61	39	1.56	17.6	42	42	37	116
47	65	40	1.62	19.3	44	42	35	116
44	63	39	1.61	15.8	39	35	33	109
—	—	39	—	21.1	42	—	35	109
Means: 46.5	61.7	38.6	1.60	18.3	41.2	38.5	34.4	112.5

Setation: Dorsal and ventral body setae (Text-figs. 18 and 19) strongly ciliated and increasing in length posteriorly from 28μ just behind scutum to 84μ at posterior margin of hysterosoma. The setation of the legs is as in *E. cairnsensis* (see Text-fig. 16).

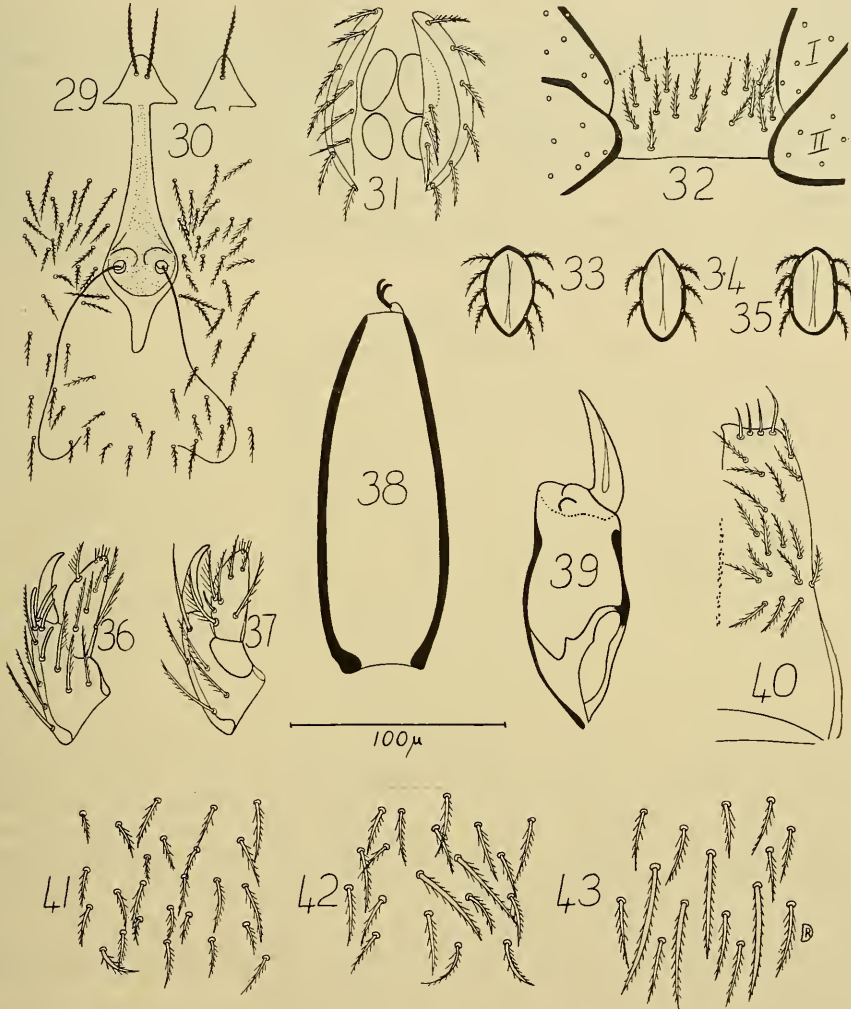
Development: The developing nymphal legs were distinct inside the larval cuticle by the fourteenth day, and a distinct dorsal spine was present, as figured by Jones (1951). The nymphs emerged 25 to 27 days after detachment.

DISCUSSION.

From both the larval and nymphal structures this species seems to be a member of the subgenus *Neotrombicula*. In nymphal characters it is almost identical with the description of the subgenotype *T. (N.) autumnalis* (Shaw, 1790), given by Richards (1950), yet the larvae are quite distinct. In Womersley's key (1952, p. 349) the specimens run to near *T. autumnalis*, but may be separated by the length of the terminal body setae, the number of ciliations on the sensillae, and the number of setae surrounding the crista. However, none of these are at all precise characters.

The nymphs may be separated from the three species of *Euschöngastia* discussed above by the presence of a complete sternum, the diamond-shaped sensillary area, and the reduced number of apical setae on the hypostome. The standard data of the scuta are also very different—CTL and ASL are much smaller due to the short crista, while TS and SS are quite noticeably larger. Otherwise the external morphology is identical, including the palpal formula.

A large series of larvae of this species is now available, and the contour of the posterior margin of the scutum shows wide variation, ranging from slightly concave, through flat, to evenly convex. Womersley (1954) described the posterior scutal margins of the two closely related species *T. novae-hollandiae* Hirst, 1929, and *T. antechinus* as "deep behind PL and rather flattened medially" and "not so deep behind PL and medially very slightly concave" respectively. Some of his specimens of



Text-figs. 29-43.—*Acomatacarus australiensis*. Nymph. 29, scutum and surrounding setae; 30, abnormal tectum with single seta; 31, genitalia; 32, sternum; 33, 34 and 35, anus; 36 and 37, internal and external view of palpal tibia and tarsus; 38, tarsus I in lateral view; 39, chelicera; 40, hypostome; 41, 42 and 43, anterior, mid-dorsal, and posterior body setae. (All to same scale, except 29, 30 and 38, which are drawn to three-quarters the indicated scale.)

the former are quite flat and even slightly concave, and the probability that these two species are the same is very strong. There is also great variation in the length of the dorsal setae, ranging from 56μ to 80μ in *T. novae-hollandiae*, and from 45μ to 58μ in *T. antechinus*. Otherwise the specimens are all identical. If the nymph of Hirst's species proves as devoid of recognizable specific characters as the present species, the problem will not be any simpler.

ACOMATACARUS AUSTRALIENSIS (Hirst, 1925).

Types: Four morphotype nymphs in Queensland Institute of Medical Research, Brisbane, and one each at South Australian Museum, Adelaide, and Institute for Medical Research, Kuala Lumpur. All reared from engorged larvae from the perineum of *Isoodon obesulus*, Paddington, Brisbane, 9.xii.55. Associated larval pelts accompany the specimens, and a large series of larval whole mounts was made.

Description of Nymph.

Body without marked medial constriction, but with anterior half much wider than posterior half, forming distinct shoulders, length 670μ to 778μ , breadth across propodosoma 342μ to 373μ , across hysterostoma 264μ to 326μ . Colour in life dull white. Genital area oval (Text-fig. 31), 89μ long; anterior suckers 22.8μ to 31.6μ , posterior suckers 21.1μ to 24.6μ long. Genital plates very narrow and weakly sclerotized, with about six ciliated setae each. Inner genital setae 3.3, slender, with very fine ciliations on anterior edge. Anus (Text-figs. 33 to 35) 41.2μ long, surrounded by sclerotized ring with from two to four ciliated setae on each side; no discrete anal plates present. Genitalia just behind level of coxae IV, and anal plates separated by slightly less than their own length from the genitalia.

TABLE 3.
Standard Data (in Micra) of Scutum of A. australiensis.

ASL.	SB.	$\frac{ASL.}{SB}$	PSL.	PAD.	TS.	SENS.
119	—	—	17.6	56	45	—
116	—	—	17.6	45	49	114
118	24.6	4.80	17.6	53	45	158
123	28.1	4.38	19.3	45	45	165
116	28.1	4.13	19.3	53	45	—
116	24.6	4.72	17.6	53	39	—
Means :						
118	26.4	4.51	18.2	51	45	156

Palpi (Text-figs. 36 and 37) five-segmented; femur with about sixteen slender ciliated setae; genu with about eighteen stronger ciliated setae. Tibia with simple claw 31.6μ long, four inner spathulate combs arranged 3.1 and one nude external seta near base of claw, in addition to two to four ciliated setae on inner face and two on the outer surface, and several strong shortly ciliated setae on the dorsal edge. Tarsus with about twelve ciliated setae, about four short nude apical setae, and a single external sensory rod, which is set rather high.

Gnathosoma: Hypostome (Text-fig. 40) with four pairs of inwardly curved simple apical setae, and numerous ciliated setae further back; with a short row of granulations medially. Chelicerae (Text-fig. 39) standard, blade 61μ long.

Legs I and IV longer than body and legs II and III; all seven-segmented. Coxae in two groups. All tarsi with two distinct claws. Sternum (Text-fig. 32) entire, with posterior margin straight; with numerous ciliated setae. Tarsus I (Text-fig. 38) slender, without preapical dorsal process, 210μ to 228μ long, 74μ to 81μ high, tibia I 130μ to 154μ long, tarsus II 98μ to 122μ long, tibia II 81μ to 88μ long.

Scutum (Text-figs. 29 and 30): Sensillary area subcircular, merging into stout posterior apodeme, and into broad crista anteriorly. Tectum distinct, arrow-shaped, with two tectal setae (only one in one specimen) set fairly well back from apex. Sensillae extremely fine and without any ciliations whatever. Eyes absent. Setae around scutum arranged as shown. The scutal standard data are given in Table 3.

Setation: Dorsal body setae (Text-figs. 41 to 43) increasing in length from 17.6μ just behind scutum to 56μ at posterior margin of body, with more ciliations on one side

than the other. The increase in length is not regular, setae of rather different lengths being mixed. The sensory setation of the legs is as in *E. perameles*.

DISCUSSION.

The colony of pale yellow, lightly pink-tinted larvae from which these nymphs were bred was found in large patches around the perineum and scrotal stalk of the host, and comprised several hundred individuals in varying degrees of engorgement. This area of skin was removed and placed in a refrigerator overnight, but few larvae disengaged. After another two full days in the refrigerator, scores of larvae had detached, and quickly became very active when placed in water. The largest were chosen to breed out nymphs. Some were placed on moist filter paper in closed containers, but these failed to moult. Others were kept in water with a little merthiolate, and nymphochrysalises were seen after fourteen to nineteen days. The nymphs emerged after 25 to 28 days. Other specimens from *Perameles nasuta*, Mt. Glorious, 22.xi.55, failed to moult.



Text-fig. 44.—*Acomatacarus australiensis*. Larva. Dorsal view of tracheal system.

The mounted larval material is without doubt *Acomatacarus australiensis* (Hirst) and has been compared closely with his excellent figures and further material from the Sydney (type) area. The holotype of *A. hirsti* (Womersley, 1944) is considered to be a typical specimen of Hirst's species. The standard data, specialized setation, and even the scutal punctae of all these specimens are identical, and the dorsal setae conform to the pattern given by Hirst, namely, a pair of humerals and two pairs of post-humerals enclosing a band of about eighteen and a short row of eight, followed by two rows of ten to twelve, and then with irregular rows arranged roughly 8.8.4.4. In engorged specimens this setal pattern is disrupted. The galeal seta is always nude. Womersley (1945) briefly described a single nymph from New Guinea as *A. australiensis*, but now (in ms.) considers this doubtful. Actually the whole genus needs revision.

Tracheal System.

Several workers (summarized by Brennan, 1949, and Wharton, 1950) have reported taenidial ducts in some larval leeuwenhoekine genera. Those opening ventrally between the gnathosoma and coxae I were believed to be tracheae. In the present species these tubes are moulted with the larval pelt and are left trailing, still attached to the spiracles. The above belief, then, seems justified. In whole mounts the larval tracheal system (Text-fig. 44) is as follows. The two spiracles are in the normal position,

8.75 μ wide anteriorly, and fairly well sclerotized. Each atrium tapers quickly, giving rise to the narrowest part of the trachea. This narrow section is quite within the limits of resolution, being about 2.3 μ in diameter. From this narrow section the trachea becomes gradually thicker, up to 3.5 μ in diameter, and runs upward in a loop near the cheliceral apodemes, and then passes ventrally again, out to the level of coxa I. It then passes medially, between coxae II, and then outward again just before the level of coxae III, where a large loop is made. It then returns medially, passes between coxae III, and, still just beneath the ventral cuticle, continues to the posterior margin of the hysterosoma. Here it follows the upward curve of the body and continues on to the dorsum, just below the cuticle, in a very tortuous path. The tracheae are thinner dorsally, up to 2.8 μ in diameter, and finish in a distinct, elongate swelling. These swellings are on an average 28 μ long and 4.55 μ in maximum diameter. Some of the folds in the tracheae are very close. A similar system is present in *A. athertonensis* Wom.

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